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Short communication

Effect of plant growth regulators on the performance of yard long bean (*Vigna unguiculata* var. *sesquipedalis* (L.) Verdcourt)

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Abstract

Four plant growth regulators namely NAA (15, 30 and 45 ppm), 2,4-D (2, 4 and 6 ppm), PCPA (25, 50 and 75 ppm) and CCC (300, 400 and 500 ppm) were sprayed on yard long bean (cv. 'Lola') at different stages of growth to evaluate its impact on flowering and fruit set. Foliar spray of NAA (15 ppm) at 15, 30 and 45 days after sowing increased fruit set and productivity, giving the highest yield of 7.49 t ha^{-1}, followed by CCC at 300 ppm. 2,4-D and PCPA had a strong depressing effect on growth and productivity.

Key words: Cowpea, NAA, PCPA, CCC

Yard long bean or pole type vegetable cowpea [*Vigna unguiculata* var. *sesquipedalis* (L.) Verdcourt] is an important vegetable of Kerala, next only to bitter gourd in coverage and popular preference (KAU, 2004). The tender green pods rich in crude protein (28%), iron (2.5 mg 100 g^{-1}), calcium (80 mg 100 g^{-1}), phosphorus (74 mg 100 g^{-1}), vitamin A (941 IU 100 g^{-1}), vitamin C (13 mg 100 g^{-1}) and dietary fibre (2 g 100 g^{-1}) make it an excellent vegetable (Singh et al., 2001). Although the crop is cultivated intensively by trailing on to bowers and trellis in view of its potential for continuous fruiting and high yield, problems such as delayed and erratic flowering and low pod set are frequent. Application of plant growth regulators has been widely recommended to overcome problems such as low flowering and poor pod set in vegetable crops. The present study, therefore, was undertaken to evaluate the effects of selected plant growth regulators on fruit set and productivity of yard long bean.

The field experiment was conducted during the *rabi* season of 2000 (September 2000 to January 2001) at Vellanikkara, Thrissur (10°31'N latitude and 76°17'E longitude and at an elevation of 40 m above sea level), with the test variety 'Lola'. The experimental site has a well-drained sandy loam soil and experiences a warm humid tropical climate. The trial was laid out in a randomized block design with three replications. The treatments included four synthetic growth regulators: viz., naphthalene acetic acid (NAA) at 15, 30 and 45 ppm; 2,4 dichlorophenoxy acetic acid (2,4-D) at 2, 4 and 6 ppm; para-chloro phenoxy acetic acid (PCPA) at 25, 50 and 75 ppm and (2-chloroethyl) trimethyl ammonium chloride (CCC) at 300, 400 and 500 ppm together with untreated and water-sprayed controls. Furthermore, NAA, 2,4-D and PCPA were applied as foliar sprays at 30, 45 and 60 days after sowing (DAS) and CCC, a growth retardant, was sprayed at 20 DAS only. Three lines of plants spaced at 1.5 x 0.45 m constituted one experimental unit (i.e., plots of size 13.5 m^2 having 18 plants each). Using a hand compressor-pneumatic sprayer, 400-800 ml of the fluid per plot depending on the stage of growth, was sprayed on the foliage. The crop was managed per local recommendations (KAU, 1996) and the data were analyzed following the ANOVA technique (Panse and Sukhatme, 1967).

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Table 1. Effect of plant growth regulators on vegetative characters, flowering and earliness

Treatments	Length of vine (m)	No. of branches	Days to first flower	Days to 50% flower	Days to first harvest	Fruit set (%)
NAA (15)	6.56^{a}	18.33^{a}	46.33^{cd}	52.67^{bc}	57.00^{cd}	100.00^{a}
NAA (30)	6.29^{b}	16.66^{bc}	47.33^{cd}	52.67^{bc}	59.33^{c}	97.33^{ab}
NAA (45)	6.07^{bc}	15.67^{cd}	50.00^{c}	57.33^{b}	58.33^{cd}	97.00^{ab}
2,4-D (2)	6.36^{e}	13.67^{e}	47.33^{cd}	81.67^{a}	56.67^{cd}	35.00^{c}
2,4-D (4)	5.20^{ef}	13.67^{e}	49.00^{c}	85.67^{a}	60.00^{c}	37.67^{c}
2,4-D (6)	5.07^{fg}	13.67^{e}	40.67^{cd}	86.67^{a}	58.67^{cd}	33.33^{c}
PCPA (25)	5.07^{fg}	13.67^{e}	48.00^{cd}	85.00^{a}	60.00^{c}	10.67^{d}
PCPA (50)	4.93^{gh}	13.67^{e}	73.33^{a}	90.67^{a}	84.33^{b}	10.00^{e}
PCPA (75)	4.79^{h}	13.33^{e}	62.67^{b}	88.33^{a}	89.00^{a}	10.00^{e}
CCC (300)	6.00^{c}	18.00^{ab}	39.33^{e}	57.33^{b}	46.00^{e}	100.00^{a}
CCC (400)	6.09^{bc}	17.67^{ab}	46.33^{cd}	55.00^{bc}	60.33^{c}	90.67^{b}
CCC (500)	6.14^{bc}	16.67^{bc}	41.00^{cd}	50.33^{bc}	55.00^{d}	97.33^{ab}
Water spray	5.96^{c}	14.33^{de}	41.33^{cd}	48.00^{bc}	48.67^{e}	93.00^{ab}
Control	5.64^{d}	14.00^{e}	42.33^{cd}	47.67^{c}	48.00^{e}	92.67^{ab}

Numerical values following the treatment codes indicate concentrations in ppm
Means followed by the same superscript do not differ significantly

A comparison of the data in Table 1 indicates significant variations for all growth characters studied. Highest vine length was recorded in NAA at 15 ppm (6.56 m) and the lowest in PCPA at 75 ppm. Similarly, the highest number of branches per plant was for NAA-15; this was, however, closely followed by the CCC treatments. Furthermore, CCC-300 lead to early flowering and fruit harvest (46 days). In this context, Ries (1985) noted that CCC application increased the synthesis of certain endogenous growth substances, which triggers metabolic processes and narrows down the carbon-nitrogen ratio in the plant— in turn, stimulating flowering and fruit set. NAA, however, delayed flowering by 8 days at 45 ppm and 4 days at 15 ppm, leading to a delayed first harvest in relation to control. Likewise, PCPA at all levels delayed flowering and fruit harvest. While fruit set was more than 97% in all concentrations of NAA and CCC (300), 2,4-D and PCPA caused considerable floral malformation and a drastic reduction in fruit-set (10.0 to 37.67% as against 92.67% in unsprayed control). In addition, both 2,4-D and PCPA applications caused substantial vegetative malformation e.g., wrinkled and cup-shaped leaves (authors' observations) and reduced plant height.

As regards to fruit characters, NAA and CCC treatments increased pod length, while 2,4-D and PCPA decreased it (Table 2). Highest pod length was noted for CCC-300 (37.8 cm), closely followed by NAA-15 and CCC-400. Average pod weight also was highest in CCC-300 (17.95 g), which was statistically at par with that of NAA-15 and CCC-400, NAA-15 and NAA-30. Consequently, productivity was highest in plants treated with NAA-15 (7.48 t ha^{-1}), which was 35% more than that of the control, and was closely followed by CCC-300 (7.36 t ha^{-1}). Increased yields in these treatments can be explained based on the enhanced vegetative growth (Table 1), increased fruit sizes and higher fruit numbers (Table 2). In particular, all concentrations of NAA and CCC showed increased fruit numbers and per plant yield, which may be because of a reduction in flower drop and fruit abortion. Coincidentally, per plant yield was highest (524.46 g) in NAA-15. Overall, NAA-15, NAA-30 and CCC-300 exerted strong favourable effects on growth and productivity of yard long bean. Conversely, 2,4-D and PCPA had profound negative effects on these parameters.

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Table 2. Effect of plant growth regulators on fruit and yield characters.

Treatments	Mean fruit length (cm)	Mean fruit weight (g)	No. of fruits per plot	Fruit yield per plant (g)	Productivity (t ha^{-1})
NAA (15)	34.49^{b}	17.81^{a}	572.39^{a}	524.46^{a}	7.48^{a}
NAA (30)	32.19^{c}	17.32^{a}	544.86^{b}	474.41^{b}	7.04^{bc}
NAA (45)	31.41^{cd}	16.35^{b}	531.35^{c}	426.85^{cd}	6.43^{d}
2,4-D (2)	31.12^{cd}	15.14^{c}	340.75^{g}	276.26^{g}	4.07^{f}
2,4-D (4)	26.74^{e}	14.31^{cde}	269.52^{i}	210.99^{i}	3.10^{gh}
2,4-D (6)	25.74^{ef}	14.01^{e}	369.62^{f}	253.47^{h}	3.12^{g}
PCPA (25)	31.17^{cd}	15.29^{cd}	323.96^{h}	209.47^{i}	3.46^{h}
PCPA (50)	27.30^{e}	14.37^{cde}	225.10^{k}	167.73^{j}	2.81^{i}
PCPA (750	24.58^{f}	14.10^{de}	252.91^{j}	175.14^{j}	2.71^{i}
CCC (300)	37.80^{a}	17.95^{a}	573.92^{a}	476.13^{b}	7.36^{ab}
CCC (400)	34.46^{b}	17.24^{a}	551.36^{b}	436.03^{c}	6.94^{c}
CCC (500)	34.16^{b}	16.17^{b}	515.36^{d}	415.49^{d}	6.45^{d}
Water spray	30.20^{d}	15.16^{c}	446.78^{e}	365.48^{e}	5.60^{e}
Control	29.62^{d}	15.03^{c}	437.55^{e}	344.68^{f}	5.54^{e}

Numerical values following the treatment codes indicate concentrations in ppm
Means followed by the same superscript do not differ significantly

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References

KAU, 1996. *Package of Practices Recommendations—Crops 96*. Kerala Agricultural University, Directorate of Extension, Mannuthy, Thrissur, pp 41

KAU, 2004. *Three decades of Vegetable Research in Kerala Agricultural University.* In: T.R. Gopalakrishnan (ed). Kerala Agricultural University, Directorate of Extension, Mannuthy, Thrissur, 153p

Panse, V.G. and Sukhatme, P.V. 1967. *Statistical Methods for Agricultural Workers*. Indian Council of Agricultural Research, New Delhi, pp 21

Ries, S.K. 1985. Regulation of plant growth with application of growth retardants. Pl. Sci., 2: 239-285

Singh, J., Kalloo, G. and Singh, K.P. 2001. *Vegetable Crops: Nutritional Security*. Indian Institute of Vegetable Research, Varanasi, 56p